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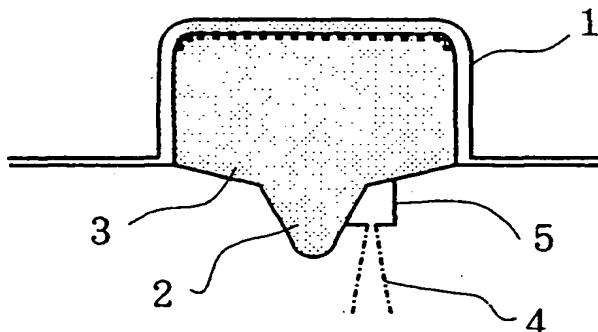
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(54) **Sheet-like key top and its manufacturing method**

(57) To make a spherical shape of a terminal end of an extruding part of a push-button switch to press a curved contact portion composed of a metal belleville spring and a resin film dome. In addition, a gate injecting mouth (4) for thermoplastic material (3) is open at the side surface of the extruding part (2) or at the side pro-

jection made in a mold to inject resin material in order to make molding of a spherical shape of the terminal end of an extruding part (2) of a push-button switch possible. By this structure, the present invention can provide a sheet-like key top having improved clicking touch and preventing breakage of a contact portion by residual stress.

FIG. 2



Descripti n

The present invention relates to a sheet-like key top and its manufacturing method, and more particularly to various switches used in telephones, keyboards of personal computers, and controllers etc. and their manufacturing methods.

The position of a gate mouth for injection of thermoplastic material is commonly set to the terminal end of an extruding part forming a projecting bottom end of a key to make the flow of the material inside an injection mold uniform and also to make a mold structure simple in order to improve molding yield of a push-button switch integrated with a film, on which a display portion curved along the upper surface of the key top body made of plastic material is printed. For this purpose the terminal end of the extruding part should be flat or concave shape. A key switch has a contact portion such as a metal belleville spring with clicking touch and a resin film dome curved to the top direction on the bottom surface of a push-button switch integrated with a film, on which a display portion curved along the upper surface of the key top body made of thermoplastic material is printed thereon molded thermoplastic material. When the push-button switch is pushed, the terminal end of the extruding part projected in the bottom direction presses the metal belleville spring and the resin film dome to input a letter or symbol. For this reason, as shown in Fig. 7 of the accompanying drawings, the contact portion is frequently pushed without accurate contact between the center a of the extruding part 11 of the push-button and the top b of the curved contact portion 12 with clicking touch. In this case, clicking touch of the contact portion decreases and the contact portion cracks by virtue of residual stress.

The present invention provides a sheet-like key top wherein an extruding part formed on a bottom surface of a sheet-like key top with which a film with a print of a display portion curved along the same shape as that of an upper surface of the key top body made of molded thermoplastic resin is formed as a single body comprises a terminal end of spherical shape.

The present invention provides a sheet-like key top having an improved clicking touch and protection of breaking of a contact portion by residual stress through making the convex terminal end of an extruding part of a push-button switch push a curved contact portion of a metal belleville spring, a resin film dome, etc. The molding of spherical shape for the terminal end of a push-button switch becomes possible by injecting thermoplastic material into the gate mouth for thermoplastic material, which is open on the side of or the side projecting portion of the extruding part.

The invention will be further described, by way of example only, with reference to the accompanying drawings, in which:

to the present invention;

Fig. 2 shows a method of molding a key top by the method of the present invention;

Fig. 3 shows a method of separate molding of a display portion of a key top and a piece of an extruding part;

Fig. 4 shows a method of molding as described in Example 1 below;

Fig. 5 shows a method of molding a display portion of a key top as described in Example 2 below;

Fig. 6 shows a method of molding a piece of an extruding part as described in Example 2 below; and Fig. 7 shows the pressed state of a conventional extruding part.

In the present invention, as shown in Fig. 1, the terminal end of an extruding part 2 of a push-button switch 1 is made as a spherical shape. As shown in Fig. 2, the molding of the spherical shape for the terminal end of the extruding part 2 becomes possible by injection into a mouth 4 for thermoplastic material 3, which is open on the side portion 5 formed on a mold or the side projecting portion of the extruding part 2.

In addition, as shown in Fig. 3, molding becomes possible by assembling to fix a display portion A of a key top to an extruding part B with a terminal end of spherical shape after separate forming on the key top display portion A of a film 7 on which a display portion 6 was previously printed and the extruding part B with the terminal end of spherical shape. This fixing method can be carried out by using a double-sided adhesive tape, an adhering method with an adhesive, a gluing method with a gluing agent, heating, or melting by ultrasonic waves.

The display portion A of a key top can be formed by injection molding of thermoplastic material holding a film 7, on which a display portion 6 has been previously printed, with the upper and lower dies of a mold for forming the display portion of the key top. The extruding part B with a terminal end of spherical shape can be formed by injection molding of thermoplastic material holding a film 9 (see Fig. 6) which has been previously perforated at a given position, with the upper and lower dies of a mold for forming the extruding part B with a terminal end of spherical shape.

The spherical shape of the terminal end of the extruding part makes the life of a contact part composed of a metal belleville spring, a resin film dome, etc. longer and also simplifies troublesome positioning steps upon assembling a sheet-like key top and these components of the contact portion. In addition, the variation of the shape of the terminal end of a extruding part can be diversified.

The present invention will be further described in detail by the following examples with reference to the accompanying drawings.

Fig. 1 shows a sectional view of a key top according

Example 1.

As shown in Fig. 4, a film 1, on which a display portion 6 has been previously printed, is set in a mold with the same shape as that of the desired shape of a key top. After mold clamping, thermoplastic material 3 is formed integrally with the film by injection molding. At this time, an injection gate mouth 8 is disposed on the side part of or the side projected portion 5 of the extruding part 2 having a terminal end of spherical shape to mold. Gate cutting is performed, at the same time, on opening. A product C is obtained and a push-button switch according to the present invention is molded.

Example 2.

Figs. 5 and 6 show other molding methods.

A film 1, on which a display portion 6 has been previously printed, is set in a mold. After mold clamping, thermoplastic material 3 is molded by injection through a gate mouth 8 to form a desired display portion A of a key top. Next, as shown in Fig. 6, a film 9 having previously been perforated at a given position is extended in the center of a mold to be set. A thermoplastic material 3 is injected through the gate mouth 8 to form a desired extruding part B with a terminal end of spherical shape at the upper and lower components holding the film. Next, a display portion A of a key top and an extruding part B with a terminal end of spherical shape which are separately formed are adjusted, and several fixed points are adhered by melting with heat or ultrasonic waves to make the push-button switch of the present invention (Fig. 3).

Either an identical material or different materials can be used for the two-piece structure composed of the display portion A of a key top and an extruding part B with a terminal end of spherical shape, because the fixing method of the film of the display portion of a key top is not restricted. In addition, either an identical material or different materials can be used because adhesion is not necessary between the thermoplastic material of the display portion of a key top and thermoplastic material of an extruding part with a terminal end of spherical shape. Therefore, clicking touch can be adjusted by free choice of the material to change modulus of elasticity.

Claims

1. A sheet-like key top wherein an extruding part (2) formed on a bottom surface of a sheet-like key top with which a film (7) with a print of a display portion (6) curved along the same shape as that of an upper surface of the key top body made of molded thermoplastic resin is formed as a single body comprises a terminal end of spherical shape.
2. A sheet-like key top as claimed in claim 1, charac-

terized in that said sheet-like key top is composed of a display portion (6) and an extruding part (2) with a terminal end of spherical shape, in which said display portion of said key top is formed by injection of thermoplastic material holding a film (7), on which the display portion has been previously printed, between upper and lower parts of a mold for forming the display portion of the key top, and the extruding part (2) with the terminal end of spherical shape is formed by injecting a thermoplastic material holding a film (9), which has been previously perforated at a given position, between upper and lower parts of a mold for forming the extruding part with the terminal end of spherical shape, and the formed display portion of the key top and the extruding part with the terminal end of spherical shape are adjusted to be fixed to each other.

3. A method of manufacturing a sheet-like key top as claimed in claim 1, which is formed by using a mold having an injection mouth (4) for thermoplastic material on a side portion or a projected side portion of the extruding part (2) having the terminal end of spherical shape.
4. A method as claimed in claim 3, characterized in that said sheet-like key top is composed of a display portion (6) and an extruding part (2) with a terminal end of spherical shape, in which said display portion of said key top is formed by injection of thermoplastic material holding a film (7), on which the display portion has been previously printed, between upper and lower parts of a mold for forming the display portion of the key top, and the extruding part (2) with the terminal end of spherical shape is formed by injecting a thermoplastic material holding a film (9), which has been previously perforated at a given position, between upper and lower parts of a mold for forming the extruding part with the terminal end of spherical shape, and the formed display portion of the key top and the extruding part with the terminal end of spherical shape are adjusted to be fixed to each other.

FIG. 1

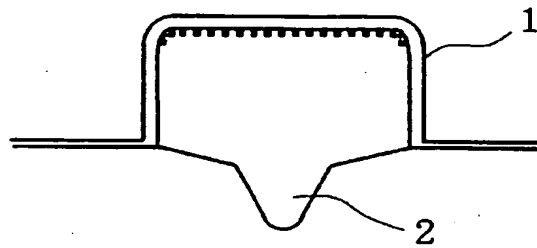


FIG. 2

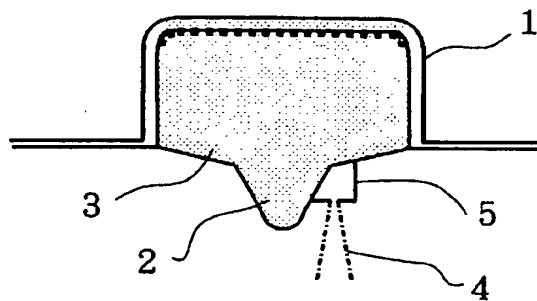


FIG. 3

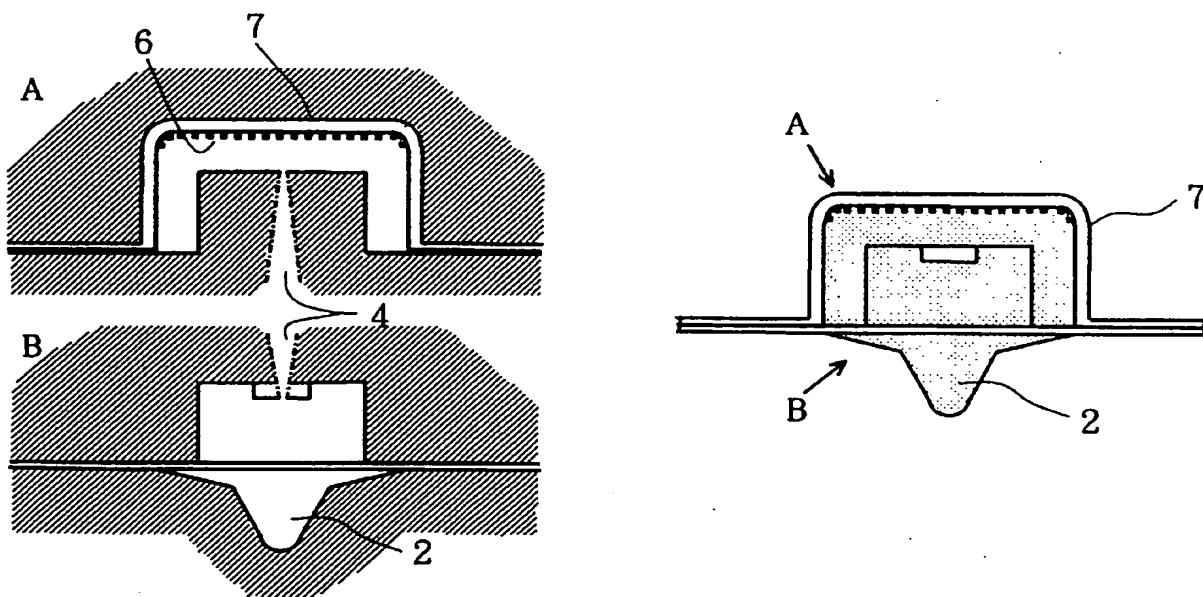


FIG 4

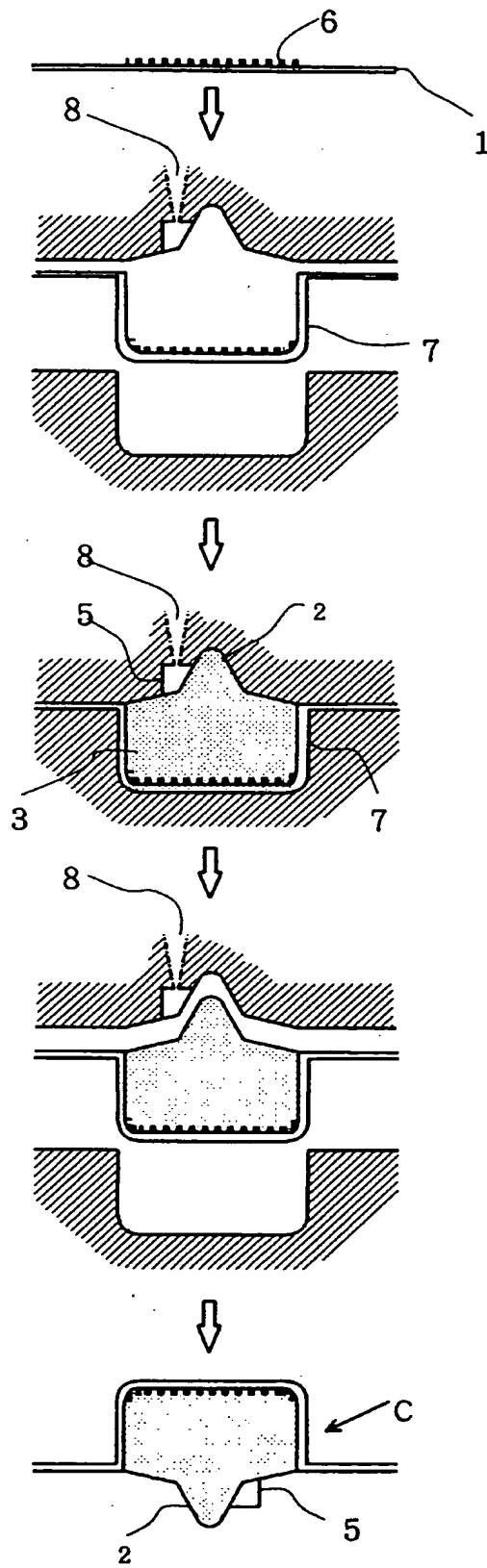


FIG. 5

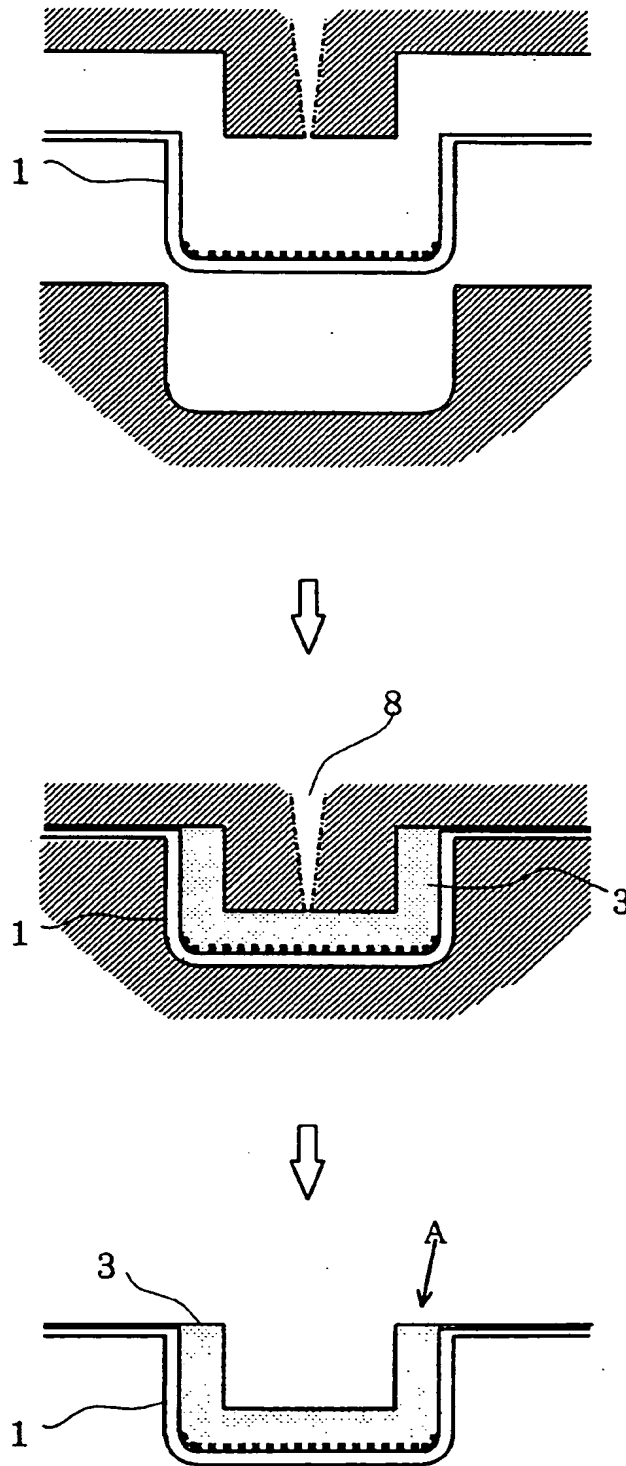


FIG. 6

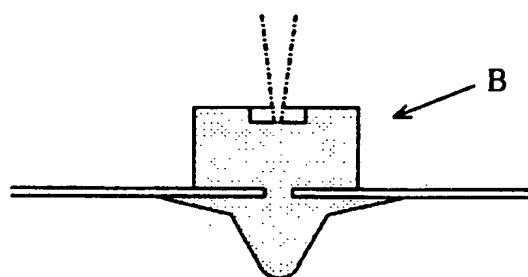
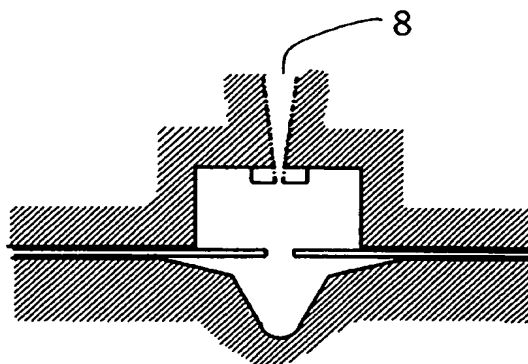
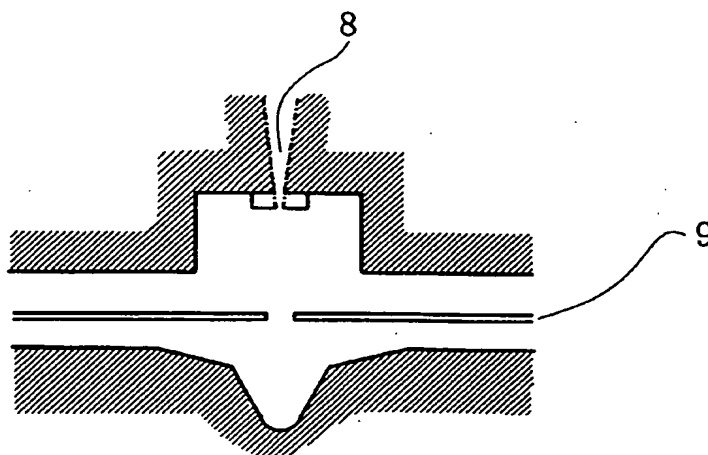
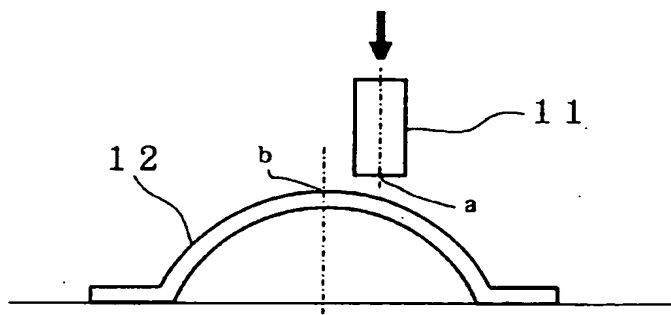


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 98302751.7
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
A	<u>US 4042090 A</u> (HASEBE, S. et al.) 16 August 1977 (16.08.77), the whole document. --	1-4	H 01 H 13/14 H 01 H 13/70
A	<u>US 3964594 A</u> (GABBRIELLI, L. et al.) 22 June 1976 (22.06.76), the whole document. ----	1-4	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 6)
			H 01 H
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 05-10-1998	Examiner ZUGAREK
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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